

A FLOWERING CALENDAR FOR JOHN FORREST NATIONAL PARK

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ABSTRACT

Flowering data were collected in John Forrest National Park on 587 species over a six year period. Unlike results from studies elsewhere, there was found to be a very regular cycle of flowering throughout the year, with a peak in August–September. The majority of species flowered regularly in vegetation where there had been an absence of fire for 16 or more years. In mid-summer to autumn 9–11% of species were flowering. This has significance for over-summer survival of nectarivores. Species that were never recorded flowering, or flowered continually, are discussed, as are species with bimodal flowering cycles.

INTRODUCTION

During a flora survey of John Forrest National Park (Armstrong and Muir 1988) flowering data were collected on 587 species of plants, including 98 introduced species. Many species were in common with flowering studies elsewhere in similar habitats (Majer 1981, Worsley Pty Ltd 1985). This paper summarises results of the John Forrest study and compares it with Majer's and Worsley's findings.

METHODS

Twenty-two study plots were established in John Forrest National Park (Figure 1). Each site was within a visually discernible habitat type: brief descriptions of sites and discussions on site similarity are presented in Armstrong and Muir (1988).

Sites were visited on a monthly basis and flowering recorded. Presence of five or more flowers, or flowering inflorescences, on a single plant was considered flowering; less was considered not flowering. Some species did not fit these criteria. For example, the presence of spores in mature sori was considered "flowering" in ferns, and mature sporulating cones of *Macrozamia riedlei* was also considered flowering.

Flowering was considered continuous if there was not more than a

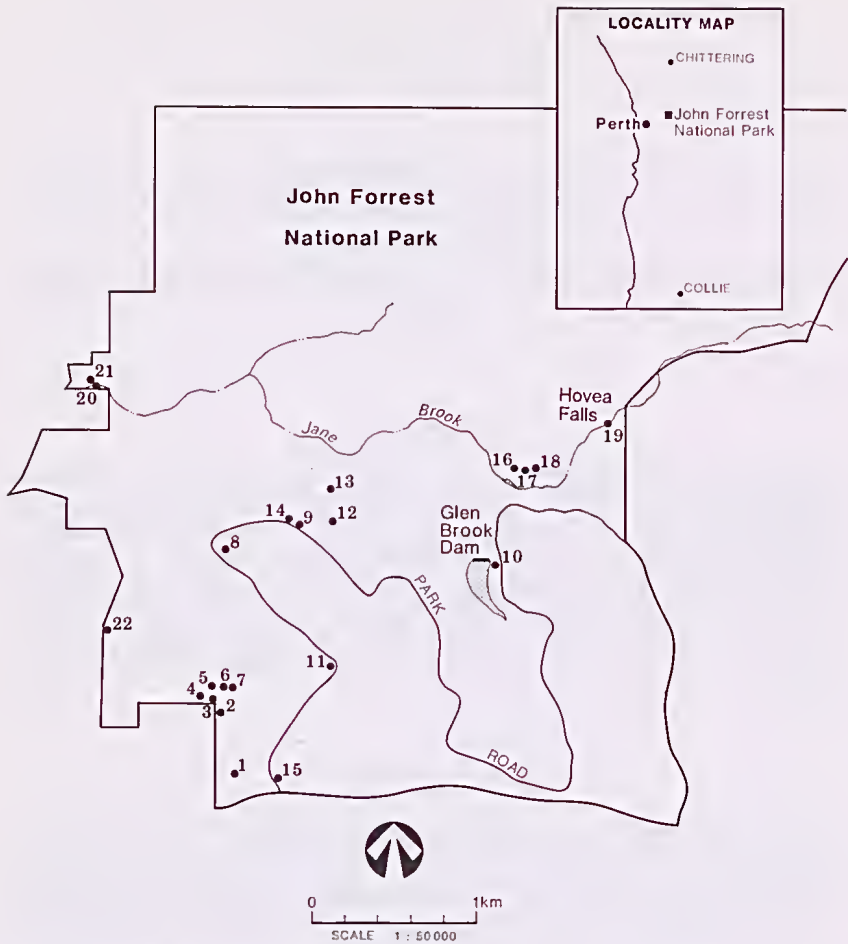


Figure 1. John Forrest National Park showing the study quadrat locations in relation to roads and Jane Brook.

single month in which flowering was not observed. Bimodal flowering, i.e. two distinct periods of flowering, was recorded where intervals of two months or more separated flowering events.

Plant species were identified at the Western Australia Herbarium (Perth) by taxonomic keys, referral to voucher specimens and some confirmations by experts in relevant taxonomic groups. Plant nomenclature follows that of Green (1985) with amendments from Supplement No. 7 (1988).

The age of vegetation since last fire (at the end of the study period) was determined by using the records of the National Parks Authority of Western Australia and Department of Conservation and Land Management. These records were checked by approximations using growth measurements of *Xanthorrhoea preissii* (Lamont and Downes 1979). Where *X. preissii* was absent or scarce

Table 1. Age of vegetation in sites used in this paper determined from records of NPA and CALM. Field estimates of age based on *X. preissii* growth (Lamont and Downes 1979) and other observations.

Site No.	Age from Park Records (yrs)	Age Estimated from <i>X. preissii</i> Growth, etc.
1	16	15
2	4	3
3	4	3
4	16	15
5	16	20
6	16	25
7	16	25
8	17	20
9	19	20
10	17	20
11	16	20
12	19	25
13	19	20
14	19	20
15	3	3
16	17	20
17	17	20
18	17	20
19	26	20
20	7	6
21	7	5
22	16	15

visual estimates of vegetation age based on extensive personal experience were used. Results from these records and estimates are presented in Table 1. It is considered that visual and documented ages of the vegetation correlated fairly well. Most of the flowering observations were made in the older vegetation so that fire influences were avoided as much as possible. The NPA and CALM records were taken to be the true fire ages.

To permit comparison of John Forrest flowering data with those of Majer (1981) and Worsley Pty Ltd (1985) it was considered important that the three study sites did not differ greatly in rainfall. Comparative rainfall data is presented in Table 2 for the study period and preceding two years (to allow for earlier bud primordia development). It appears that the rainfall at John Forrest is similar to that at Majer's (1981) Victoria Reservoir site. The average rainfall at the Worsley (Boddington) site is about 100mm less but probably not so different as to devalue the comparison.

RESULTS

Data were obtained on 587 species of plants; 489 native species and 98 introduced. Eighty-six families are represented, with a mean of

6.8 species per family. Appendix I lists the species recorded, flowering months and site numbers where the data were recorded. Figure 2 shows the number of species flowering each month for native and introduced species.

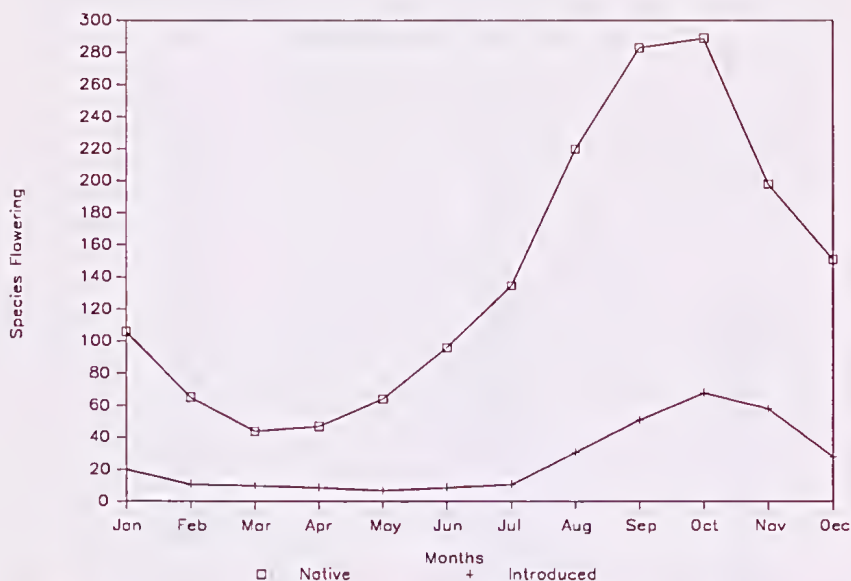


Figure 2. Number of native and introduced species flowering each month.

Table 2. Average annual rainfall for each study area. Data for Majers' (1981) study from Victoria Reservoir 5km WNW of the study area; for Worsley Pty Ltd (1985) study from Tunnel Road on the western edge of their Boddington study area; John Forrest data from the Ranger Station within the Park. Mean annual rainfall is presented for the period of the study and the two years preceding its commencement.

Year	Majer (1981) Study Area	Worsley (1985) Study Area	John Forrest National Park
1985		674	849
1984		706	960
1983		950*	808
1982		663*	794
1981		606*	878
1980		751	942
1979	831	481*	766
1978	949	715*	856
1977	807		
1976	917		
MEAN	876	693*	856

Note: * based on incomplete data.

DISCUSSION

Data on fire age shows that 17 of the study sites were in vegetation at least 16 years old. This was well past the 3–5 year old period of maximum species diversity identified for jarrah forest by Bell and Koch (1980) and thus should have avoided biased flowering results caused by post-fire successional species or fire-stimulated flowering. Three of the remaining five sites were in the peak species-diversity / age range, therefore this phenomenon was taken into account. In the older sites flowering times observed probably represent fairly well the natural flowering cycle of the species. It is of note that of the 587 species recorded only a few were found exclusively in the sites of lesser fire age. It can therefore be suggested that the majority of the species are able to flower successfully in long-unburnt bushland. Data in this study were collected over a longer period (6 years) than previous studies in Australia (Table 3), and thus may "average out" many climatic factors which could cause variations in flowering from one year to the next. Additionally, the study included more species.

It is noteworthy that all previous authors recorded, or mentioned specifically, minor peaks in flowering in months other than spring (e.g. Worsley, 1985). These may be artefacts of insufficient data. The John Forrest study resulted in a very smooth graph of flowering, with a peak in spring, and no evidence of minor peaks in other months (Figure 2). It may be that with greater amounts of data similar results could be found in vegetation elsewhere.

Peak of flowering is clearly in September–October (spring). A significant factor is the relatively large numbers of species flowering in late summer and early autumn (February to April) when flowering appears in most studies to have almost ceased (13% of species in February, 9.1% in March and 9.5% in April). Using Keighery's (unpublished) provisional list of genera visited by *Apis mellifera*, the common honey bee, one can estimate the number of

Table 3. Location of studies on flowering in Australia, the number of species considered, length of the study and the reference.

Location of Study	Number of Species	Period of Study (yrs)	Reference
WA Banksia woodland	75	2	Milewski & Davidge (1980)
Vic heath	85	?	Patton (1933)
SA heath	102	3	Specht & Rayson (1957)
SA Wilsons Prom.	117	4	Groves & Specht (1965)
WA jarrah forest	102	1	Majer (1981)
WA jarrah forest	222	1	Worsley Pty Ltd (1985)
This study	587	6	

Table 4. List of genera visited by *Apis mellifera*, the number of species in the genera recorded flowering in John Forrest National Park between February–April, and the resource collected by the bees. Modified from Keighery (unpub.).

Family/genera	No. Species Flowering February–April	Source of:	
		Pollen	Nectar
ZAMIACEAE			
<i>Macrozamia</i>	1	x	
CYPERACEAE			
<i>Lepidosperma</i>	6	x	
<i>Mesomelaena</i>	2	x	
JUNCACEAE			
<i>Juncus</i>	2	x	
XANTHORRHOEACEAE			
<i>Lomandra</i>	2	x	x
CASUARINACEAE			
<i>Casuarina</i>	1	x	
PROTEACEAE			
<i>Adenanthos</i>	1	x	?
<i>Banksia</i>	1	x	x
<i>Dryandra</i>	1	x	x
<i>Grevillea</i>	3	x	x
AMARANTHACEAE			
<i>Ptilotus</i>	3	x	x
PITTOSPORACEAE			
<i>Billardiera</i>	1	x	x
MIMOSACEAE			
<i>Acacia</i>	3	x	x
PAPILIONACEAE			
<i>Daviesia</i>	1	x	?
<i>Jacksonia</i>	1	?	?
POLYGALACEAE			
<i>Comesperma</i>	1	x	
SAPINDACEAE			
<i>Dodonaea</i>	1	x	
DILLENIACEAE			
<i>Hibbertia</i>	2	x	
MYRTACEAE			
<i>Agonis</i>	1	x	x
<i>Astartea</i>	1	x	x
<i>Baeckea</i>	1	x	x
<i>Beaufortia</i>	1	x	x
<i>Calothamnus</i>	1	x	x
<i>Calytrix</i>	1	x	?
<i>Darwinia</i>	1	x	
<i>Eucalyptus</i>	6		x
<i>Verticordia</i>	1	x	x
EPACRIDACEAE			
<i>Leucopogon</i>	1	x	
LOGANIACEAE			
<i>Logania</i>	1	x	x
GOODENIACEAE			
<i>Scaevola</i>	2	x	x
STYLIDIACEAE			
<i>Stylidium</i>	1	x	?
ASTERACEAE			
<i>Olearia</i>	1	x	?

species recorded in John Forrest National Park which fall into each genus and thus the number of species possibly providing honey, nectar or both. This may also be significant to native insects and birds. Results are presented in Table 4.

This exercise possibly demonstrates that as many as 52 species may produce pollen and 26 nectar during the period of apparently poor flowering. These data suggest the native fauna may be fairly well catered for and could survive the summer/autumn stress period satisfactorily. This is providing other influences such as severe drought or fires do not reduce flowering over that period, or that large numbers of introduced honey bees do not greatly increase competition for resources. This finding is in contrast with suggestions that some fauna may be suffering severe food stress during autumn.

Eight species of plants were never recorded flowering. These were:

Cheilanthes distans (sporulating), *Mesomelaena pseudostygia*, *Kingia australis*, *Haemodorum spicatum*, *Caladenia menziesii*, *Phoenix dactylifera*, *Tribulus terrestris* and *Ricinus communis*. Some of these are inconspicuous and could have been missed, e.g. *Cheilanthes distans*, but others are normally obvious, e.g. *Kingia australis*. It is considered unlikely that flowering in these species went unnoticed and further research is needed to determine the frequency, duration and environmental triggers of flowering of these species.

Supplementary data for species not recorded flowering have been included into Appendix I for completeness. These data were obtained from specimens at Perth Herbarium collected near the study site.

Eleven species showed almost continuous flowering throughout the year. These were:

Plerosorus rutifolius, *Cymbopogon obtectus*, *Rhynchelytrum repens*, *Themeda australis*, *Adenanthos barbigerus*, *Grevillea bipinnatifida*, *Grevillea glabrata*, *Jacksonia sternbergiana*, *Hibbertia hypericoides*, *Darwinia citriodora* and *Hypochaeris glabra*. Of these only two, *Rhynchelytrum repens* (Poaceae) and *Hypochaeris glabra* (Asteraceae) were introduced species, all others being native. If one examines the proportion of flowering introduced species in the poorest month (May, 7 species) to the best month (October, 68 species) about one-tenth as many are flowering in May. Similar results (1:6.5) are found with native species (poorest month March, 44 species, best month October, 288 species flowering).

Seven species showed discontinuous periods of flowering:

Pennisetum setaceum (May–June and November–February), *Lepidosperma angustatum* (April–June and October), *Laxmannia squarrosa* (May, July and October–November), *Tricoryne elatior* (June and October–March), *Andersonia lehmanniana* (April–September and December), *Scaevola fasciculata* (May and August–January) and

Olearia paucidentata (April–July and October and January). As a break in flowering of 2 months was used as the criterion for discontinuous flowering the non-flowering periods are considered quite substantial. *Pennisetum setaceum*, *Lepidosperma angustatum* and *Tricoryne elatior* demonstrated clear-cut bimodal flowering, usually in autumn/early winter, and a second peak in spring/summer. These probably relate to a sudden burst of activity when the first winter rains come to warm soils and the second when the soils begin to warm after winter but the ground is still moist. Others showed more irregular and difficult to interpret peaks of flowering. Worsley Pty Ltd (1985) listed four species with apparently bimodal flowering. One of these, *Eriochilus dilatatus* (April and October) which we recorded at John Forrest flowering in May but not at any other time may be worthy of further investigation as a truly bimodal flowerer. Of the other three species, *Lobelia heterophylla* and *Tetraria octandra* we recorded flowering continuously over the between-flowering period recorded by Worsley. *Tremandra stelligera* was recorded by Worsley Pty Ltd flowering in February and November, but we did not find it in John Forrest National Park.

ACKNOWLEDGEMENTS

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FAMILY	FLOWERING MONTH												LOCATION WITHIN JOHN FORREST NATIONAL PARK											
	J	F	M	A	M	J	J	A	S	O	N	D	0	0	0	0	0	0	0	0	0	0	1	1
Genus/species	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2		
POACEAE(cont.)																								
<i>Themeda australis</i>	F	F																						
* <i>Trachynia distachya</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
* <i>Vulpia bromoides</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
CYPERACEAE																								
<i>Baukea juncea</i>	F																							
<i>Baukea riparia</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Chorizandra enodis</i>	.	.	.	F	F	F	F	F	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Chorizandra multiarticulata</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Cyathochaeta avenacea</i>	F	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
* <i>Cyperus polystachyos</i>	F	F	F	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
* <i>Cyperus tenellus</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Gahnia aff. trifida</i>	.	.	.	.	.	.	.	F	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Isolepis cernua</i>	.	.	.	.	.	.	.	F	F	F	F	.	.	.	.	.	.	.	.	.	.	.
<i>Isolepis cyperoides</i>	F	.	.	.	.	.	.	.	F	F	F	.	.	.	.	.	.	.	.	.	.	.
<i>Isolepis oldfieldiana</i>	F	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
* <i>Isolepis prolifera</i>	F	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Isolepis stellata</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Lepidosperma angustatum</i>	.	.	F	F	F	F	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Lepidosperma drummondii</i>	.	.	F	F	F	F	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Lepidosperma leptostachyum</i>	.	.	F	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Lepidosperma longitudinale</i>	.	.	F	F	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Lepidosperma scabra</i>	.	.	F	F	F	F	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Lepidosperma tetraquetrum</i>	F	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Lepidosperma tuberculatum</i>	.	.	F	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Lepidosperma sp. A</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

	FLOWERING MONTH												LOCATION WITHIN JOHN FORREST NATIONAL PARK															
	J	F	M	A	M	J	J	A	S	O	N	D	0	0	0	0	0	0	1	1	1	1	1	1	1	2	2	
<i>Lomandra purpurea</i>
<i>Lomandra sericea</i>	F	F	F	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Lomandra spartea</i>
<i>Lomandra suaveolens</i>	F	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
XANTHORRHOACEAE																												
<i>Xanthorrhoea acanthostachya</i>	F	F	F	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Xanthorrhoea gracilis</i>	F	F	F	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Xanthorrhoea preissii</i>	F	F	F	F	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
PHORMIACEAE																												
<i>Dianella divaricata</i>	F	F	F	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Stypandra glauca</i>	F	F	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
ANTHERICACEAE																												
<i>Agrostocrinum scabrum</i>	F	F	F	F	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Arrhophodium capillipes</i>	F	F	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Borya sphaerocephala</i>	F	F	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Caesia parviflora</i>	F	F	F	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Chamaecilla corymbosa</i>
<i>Laxmannia ramosa</i>	F	F	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Laxmannia sessiliflora</i>	F	F	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Laxmannia squarrosa</i>	F	F	F	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Sowerbaea laxiflora</i>	F	F	F	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Thysanotus anceps</i>	F	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Thysanotus asper</i>
<i>Thysanotus dichotomus</i>	F	F	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Thysanotus fastigiatus</i>	F	F	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

FAMILY	FLOWERING MONTH												LOCATION WITHIN JOHN FORREST NATIONAL PARK											
	J	F	M	A	M	J	J	A	S	O	N	D	0	0	0	0	0	0	0	0	0	0	0	0
Genus species													1	2	3	4	5	6	7	8	9	0	1	
ANTHERICACEAE (cont.)																								
<i>Thysanotus manglesianus</i>	F	F	F	.	.	.	.	.	.	.	.	.	.	.	.
<i>Thysanotus multiflorus</i>	F	F	F	.	+	.	.	.	.	.	.	.	.	.	.
<i>Thysanotus scaber</i>	F	F	F	.	+	.	.	.	.	.	.	.	.	.	.
<i>Thysanotus sparteus</i>	F	F	.	.	.	.	.	.	.	F	F	F	+	.	.	.	.	.	.	.	.	.	.
<i>Thysanotus tenellus</i>	F	F	F	.	.	.	.	.	.	.	.	.	.	.	.
<i>Thysanotus thyrsoideus</i>	F	F	.	+	.	.	.	.	.	.	.	.	.	.
<i>Tricoryne elatior</i>	F	F	F	.	.	.	.	.	.	F	F	F	+	.	.	.	.	.	.	.	.	.	.
COLCHICACEAE																								
<i>Burchardia multiflora</i>	F	F	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Burchardia umbellata</i>	F	F	F	.	+	.	.	.	.	.	.	.	.	.	.
<i>Wurmbea dioica</i>	F	F	F	.	.	.	.	.	.	.	.	.	.	.	.
<i>Wurmbea pygmaea</i>	F	F	.	.	.	.	.	.	.	.	.	.	.	.	.
HAEMODORACEAE																								
<i>Anigozanthos bicolor</i>	F	F	F	.	.	.	.	.	.	.	.	.	.	.	.
<i>Anigozanthos manglesii</i>	F	F	F	.	+	.	.	.	.	.	.	.	.	.	.
<i>Conostylis androstemma</i>	F	F	F	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Conostylis caricina</i>	F	F	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Conostylis setigera</i>	F	F	F	.	+	.	.	.	.	.	.	.	.	.	.
<i>Conostylis setosa</i>	F	F	F	.	+	.	.	.	.	.	.	.	.	.	.
<i>Haemodorum laxum</i>	F	F	F	.	+	.	.	.	.	.	.	.	.	.	.
<i>Haemodorum simplex</i>	F	F	F	.	.	.	.	.	.	.	.	.	.	.	.
<i>Haemodorum spicatum</i>	F	F	F	.	.	.	.	.	.	.	.	.	.	.	.
<i>Tribonanthes brachypetala</i>	F	F	F	.	.	.	.	.	.	.	.	.	.	.	.
<i>Tribonanthes longipetala</i>	F	F	F	.	.	.	.	.	.	.	.	.	.	.	.

	FLOWERING MONTH												LOCATION WITHIN JOHN FORREST NATIONAL PARK													
	J	F	M	A	M	J	J	A	S	O	N	D	0	0	0	0	0	0	1	1	1	1	1	1	2	2
HYPOXIDACEAE																										
<i>Hypoxis occidentalis</i>	.	.	.	F	F	F	F	F	.	.	.	.	+	+	+	+	+	+	+	+	+	+	+	+	+	+
DIOSCOREACEAE																										
<i>Dioscorea hastifolia</i>	.	.	.	F	F	F	F	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	+
IRIDACEAE																										
* <i>Freesia aff. leichlinii</i>	.	.	.	.	.	.	F	F	F	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
* <i>Gladioluscaryophyllaceus</i>	.	.	.	.	.	.	F	F	F	.	F	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+
* <i>Gladiolus undulatus</i>	F	.	.	.	.	.	.	.	.	F	F	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+
* <i>Homeria flaccida</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
* <i>Homeria miniata</i>	.	.	.	.	.	.	.	.	.	F	F	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
* <i>Ixia polystachya</i>	F	.	.	.	.	.	.	.	.	F	F	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Orthrosanthus laxus</i>	.	.	.	.	.	.	.	.	.	F	F	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Patersonia juncea</i>	.	.	.	.	.	.	.	.	.	F	F	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Patersonia pygmaea</i>	.	.	.	.	.	.	F	F	F	F	F	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Patersonia rudis</i>	F	.	.	.	.	.	.	.	.	F	F	F	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Patersonia umbrosa</i>	.	.	.	.	.	.	.	.	.	F	F	F	.	.	.	.	.	.	.	.	.	.	.	.	.	.
* <i>Romulea rosea</i>	.	.	.	.	.	.	.	.	.	F	F	F	.	.	.	.	.	.	.	.	.	.	.	.	.	.
* <i>Sparaxis pillansii</i>	.	.	.	.	.	.	.	.	.	F	F	F	.	.	.	.	.	.	.	.	.	.	.	.	.	.
* <i>Watsonia bulbifera</i>	.	.	.	.	.	.	.	.	.	F	F	F	.	.	.	.	.	.	.	.	.	.	.	.	.	.
* <i>Watsonia leipoldtii</i>	.	.	.	.	.	.	.	.	.	F	F	F	.	.	.	.	.	.	.	.	.	.	.	.	.	.
ORCHIDACEAE																										
<i>Caladenia deformis</i>	.	.	.	.	.	.	F	F	F	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+
<i>Caladenia filamentosa</i>	.	.	.	.	.	.	.	F	F	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Caladenia flava</i>	.	.	.	.	.	.	.	.	F	F	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Caladenia gemmata</i>	.	.	.	.	.	.	.	.	.	F	F	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+

FAMILY	FLOWERING MONTH												LOCATION WITHIN JOHN FORREST NATIONAL PARK																																						
	J			F			M			A			M			J			J			A			S			O			N			D																	
	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	2																		
Genus species																																																			
ORCHIDACEAE (cont.)																																																			
<i>Caladenia longicauda</i>																																																			
<i>Caladenia longiclavata</i>																																																			
<i>Caladenia menziesii</i>																																																			
<i>Caladenia reptans</i>																																																			
<i>Caladenia sericea</i>																																																			
<i>Duiris laxiflora</i>																																																			
<i>Duiris longifolia</i>																																																			
<i>Elythranthera brunonis</i>																																																			
<i>Elythranthera emarginata</i>																																																			
<i>Eriochilus dilatatus</i>																																																			
<i>Leporella fimbriata</i>																																																			
<i>Lyperanthus nigricans</i>																																																			
<i>Lyperanthus serratus</i>																																																			
<i>Microtis atrata</i>																																																			
<i>Microtis uniFolia</i>																																																			
* <i>Monadenia bracteata</i>																																																			
<i>Prasophyllum drummondii</i>																																																			
<i>Prasophyllum fimbria</i>																																																			
<i>Prasophyllum macrostachyum</i>																																																			
<i>Pterostylis barbata</i>																																																			
<i>Pterostylis recurva</i>																																																			
<i>Pterostylis vittata</i>																																																			
<i>Spiculaciliata</i>																																																			
<i>Thelymitra antenniferia</i>																																																			
<i>Thelymitra crinita</i>																																																			
<i>Thelymitra nuda</i>																																																			

	FLOWERING MONTH												LOCATION WITHIN JOHN FORREST NATIONAL PARK													
	J	F	M	A	M	J	J	A	S	O	N	D	0	0	0	0	0	0	1	1	1	1	1	1	2	2
CASUARINACEAE																										
<i>Allocasuarina fraseriana</i>						F	F	F	F				+													
<i>Allocasuarina huegeliana</i>						F	F	F	F																	
<i>Allocasuarina humilis</i>						F	F	F	F																	
MORACEAE																										
* <i>Ficus carica</i>	F										F	F														
PROTEACEAE																										
<i>Adenanthos barbigerus</i>	F	F	F	F	F	F	F	F	F	F	F		+													
<i>Banksia grandis</i>									F	F	F															
<i>Banksia littoralis</i>																										
<i>Conospermum huegelii</i>										F	F															
<i>Dryandra armata</i>						F	F	F																		
<i>Dryandra bipinnatifida</i>										F																
<i>Dryandra carduacea</i>										F																
<i>Dryandra nivea</i>						F	F	F	F																	
<i>Dryandra sessilis</i>						F	F	F	F	F																
<i>Grevillea bipinnatifida</i>	F	F	F	F	F	F	F	F	F	F	F															
<i>Grevillea endlicheriana</i>	F					F	F	F	F	F	F															
<i>Grevillea glabrata</i>	F	F	F	F	F	F	F	F	F	F	F															
<i>Grevillea pilulifera</i>										F																
<i>Grevillea quercifolia</i>										F	F															
<i>Grevillea synapheae</i>										F	F	F														
<i>Grevillea wilsonii</i>	F					F	F	F	F	F	F															
<i>Hakea amplexicaulis</i>										F	F															
<i>Hakea auriculata</i>										F	F															
<i>Hakea cristata</i>						F	F	F																		

	FLOWERING MONTH												LOCATION WITHIN JOHN FORREST NATIONAL PARK																												
	J	F	M	A	M	J	J	A	S	O	N	D	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2							
SANTALACEAE													1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2							
<i>Leptomeriacunninghamii</i>	.	.	.	F	F	F	F	F	F	F	F	F	+	+																											
<i>Santalum acuminatum</i>	F	F	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
LORANTHACEAE																																									
<i>Amyema miquelii</i>	.	F	F	F	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Amyema preissii</i>	F	F	F	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Nuyssia floribunda</i>	F	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
RAFFLESACEAE																																									
<i>Ptilostyles hamiltonii</i>	.	F	F	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
POLYGONACEAE																																									
<i>Muehlenbeckia adpressa</i>	F	F	F	F	
<i>Rumex pulcher</i>	F	F	
AMARANTHACEAE																																									
<i>Alternanthera nodiflora</i>	F	F	F	F	
<i>Ptilotus declinatus</i>	F	F	F	
<i>Ptilotus esquamatus</i>	F	F	F	F	F	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
<i>Ptilotus manglesii</i>	F	F	F	F	F	F	+
<i>Ptilotus polystachyus</i>	F	F	F	F	F	F
PORTULACACEAE																																									
<i>Calandrinia brevipedata</i>	F	F	
CARYOPHYLLACEAE																																									
* <i>Ceratium glomeratum</i>	F	F	
* <i>Petrohragia velutina</i>	F	F	F	

FLOWERING MONTH LOCATION WITHIN JOHN FORREST NATIONAL PARK

	J	F	M	A	M	J	J	A	S	O	N	D																											
														1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2				
<i>Drosera macrantha</i>	F	F	F	F	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Drosera menziesii</i>	F	F	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Drosera microphylla</i>	F	F	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Drosera pallida</i>	F	F	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Drosera platystigma</i>	F	F	F	F	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Drosera stolonifera</i>	F	F	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

CRASSULACEAE

- Crassula colorata*
- * *Crassula natans*

PITTOSPORACEAE

- Billardiera bicolor*
- Billardiera candida*
- Billardiera coerulea-punctata*
- Billardiera drummondiana*
- Pronaya fraseri*
- Sollya heterophylla*

MIMOSACEAE

- Acacia acuminata*
- Acacia alata*
- Acacia barbinervis*
- * *Acacia decurrens*
- Acacia drummondii*
- Acacia extensa*
- Acacia lasiocarpa*
- Acacia nervosa*

FAMILY FLOWERING MONTH LOCATION WITHIN JOHN FORREST NATIONAL PARK

Genus species	J	F	M	A	M	J	J	A	S	O	N	D	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	2	2	2				
	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2			
MIMOSACEAE (cont.)																																			
<i>Acacia obovata</i>	.	.	.	F	F	F	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Acacia oncinoophylla</i>	F	F	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
* <i>Acacia podalyriifolia</i>	.	.	.	F	F	F	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Acacia pulchella</i>	F	F	F	F	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
* <i>Acacia pycnantha</i>	F	F	F	F	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Acacia saligna</i>	
<i>Acacia stenoptera</i>	
<i>Acacia teretifolia</i>	F	.	.	.	.	.	.	.	.	F	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Acacia urophylla</i>	.	.	.	F	F	F	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Acacia willdenowiana</i>	F	F	F	F	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
CAESALPINIACEAE																																			
<i>Labichea lanceolata</i>	F	.	.	.	.	F	F	F	F	F	F	F	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Labichea punctata</i>	F	F	F	F	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
PAPILIONACEAE																																			
<i>Bossiaea eriocarpa</i>	F	F	F	F	F	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Bossiaea ornata</i>
<i>Bossiaea pulchella</i>
<i>Chorizema dicksonii</i>
<i>Chorizema ilicifolium</i>
* <i>Cytisus proliferus</i>
<i>Daviesia coriata</i>
<i>Daviesia decurrens</i>	F	F	F	F	F	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Daviesia hakeoides</i>	F	F	F	F	F	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Daviesia horrida</i>
<i>Daviesia polypphylla</i>

LOCATION WITHIN JOHN FORREST NATIONAL PARK

FLOWERING MONTH

	LOCATION WITHIN JOHN FORREST NATIONAL PARK																							
	1	2	3	4	5	6	7	8	9	0	1	2												
	FLOWERING MONTH																							
	J	F	M	A	M	J	J	A	S	O	N	D												
<i>Daviesia preissii</i>	F	F	.	.	.	.	.	.	.	.	F	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Daviesia rhombifolia</i>	F	F	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Daviesia triflora</i>	F	F	F	F	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Dillwynia</i> sp. A	F	F	F	F	F	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Gastrolobium calycinum</i>	F	F	F	F	F	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Gastrolobium epacritoides</i>	F	F	F	F	F	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Gastrolobium spathulatum</i>	F	F	F	F	F	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Gastrolobium villosum</i>	F	F	F	F	F	.	.	.	.	.	.	.	.	.	.	.	.	.
* <i>Genista linifolia</i>	F	F	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Gompholobium knightianum</i>	F	F	F	.	.	.	.	.	.	.	.	.	.	.	.
<i>Gompholobium marginatum</i>	F	F	F	.	.	.	.	.	.	.	.	.	.	.	.
<i>Gompholobium polymorphum</i>	F	F	F	.	.	.	.	.	.	.	.	.	.	.	.
<i>Gompholobium preissii</i>	F	F	F	.	.	.	.	.	.	.	.	.	.	.	.
<i>Gompholobium shuttleworthii</i>	F	F	.	.	.	.	.	.	.	.	.	.	.
<i>Hardenbergia comptoniana</i>	F	.	.	.	.	.	.	.	.	.	.	.
<i>Hovea chorizemifolia</i>	F	F	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Hovea pungens</i>	F	F	F	F	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Hovea trisperma</i>	F	F	F	F	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Isorhopes cuneifolia</i>	F	F	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Jacksonia alata</i>	F	.	.	.	.	.	.	.	.	.	.	.	.
<i>Jacksonia restioides</i>	F	.	.	.	.	.	.	.	.	.	.	.
<i>Jacksonia sternbergiana</i>	F	F	F	.	.	.	.	.	.	.	.
<i>Kennedia coccinea</i>	F	.	.	.	.	.	F	F	F	F	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Kennedia prostrata</i>	F	F	F	.	.	.	.	.	.	.	.
<i>Kennedia stiringii</i>	F	F	.	.	.	.	.	.	.	.
<i>Lotus angustissimus</i>	F	.	.	.	.	.	.	.	.	.	.	.	.	.	F	F	F	.	.	.	.	.	.	.
* <i>Lupinus cosentinii</i>	F	F	.	.	.	.	.	.	.

FAMILY FLOWERING MONTH LOCATION WITHIN JOHN FORREST NATIONAL PARK

Genusspecies J F M A M J J A S O N D 0 0 0 0 0 0 0 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 2 2 2 2

PAPILIONACEAE (cont.)

* <i>Medico polymorpha</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Mirbeta spinosa</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
* <i>Ornithopus compressus</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Oxylobium capitatum</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Oxylobium obovatum</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Pultenaea ericifolia</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Sphaerolobium aff. macranthum</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Templetonia biloba</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Templetonia drummondii</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
* <i>Trifolium angustifolium</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
* <i>Trifolium campestre</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
* <i>Trifolium dubium</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
* <i>Trifolium glomeratum</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
* <i>Trifolium hitrtum</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
* <i>Trifolium subterraneum</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Viminaria juncea</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

GERANIACEAE

* <i>Erodium botrys</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Erodium cygnorum</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Geranium solanderi</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

OXALIDACEAE

* <i>Oxalis corniculata</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
* <i>Oxalis glabra</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

		LOCATION WITHIN JOHN FORREST NATIONAL PARK																						
												1	2	3	4	5	6	7	8	9	0	1	2	
		FLOWERING MONTH																						
J	F	M	A	M	J	J	A	S	O	N	D													
* <i>Oxalis pes-caprae</i>	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	
* <i>Oxalis purpurea</i>	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	
LINACEAE																								
<i>Linum marginale</i>	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	
* <i>Linum trigynum</i>	F	·	·	·	·	·	·	·	·	·	F	F	·	·	·	·	·	·	·	·	·	·	·	
ZYGOPHYLLACEAE																								
<i>Tribulus terrestris</i>	F	F	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·
RUTACEAE																								
<i>Boroniacynosa</i>	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·
<i>Boroniovata</i>	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·
<i>Boroniaramosa</i>	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·
<i>Diplolaena andrewsii</i>	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·
<i>Ertostemon spicatus</i>	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·
TREMADRACEAE																								
<i>Tetradhaca hirsuta</i>	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·
<i>Tetradhaca nuda</i>	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·
<i>Tetradhaca pilifera</i>	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·
POLYGALACEAE																								
<i>Comesperma calymega</i>	F	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·
<i>Comesperma ciliatum</i>	F	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·
<i>Comesperma virgatum</i>	F	F	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·
EUPHORBIACEAE																								
<i>Monotaxis grandiflora</i>	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·
<i>Phyllanthus calycinus</i>	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·

FAMILY	FLOWERING MONTH												LOCATION WITHIN JOHN FORREST NATIONAL PARK											
	J	F	M	A	M	J	J	A	S	O	N	D	0	0	0	0	0	0	0	0	0	0	0	0
Genus species													1	2	3	4	5	6	7	8	9	0	1	2
MYRTACEAE(cont.)																								
<i>Beaufortia purpurea</i>	F	F	.	.	.	.	.	.	.	F	F	F	.	.	.	.	.	.	.	.	.	.	.	.
<i>Calothamnus quadrifidus</i>	F	.	.	F	F	F	.	.	F	F	F	F	.	.	.	.	.	.	.	.	.	.	.	.
<i>Calothamnus sanguineus</i>	.	F	F	F	F	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.
<i>Calytrix aurea</i>	F	F	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Calytrix glutinosa</i>	.	.	.	.	.	.	.	.	F	F	F	.	+	.	.	.	.	.	.	.	.	.	.	.
<i>Calytrix variabilis</i>	.	.	.	.	.	.	.	.	F	F	F	.	+	.	.	.	.	.	.	.	.	.	.	.
<i>Darwinia citriodora</i>	F	F	F	F	F	F	F	F	F	F	F	F	+	.	.	.	.	.	.	.	.	.	.	.
<i>Darwinia pimeleoides</i>	.	.	.	.	.	.	.	.	F	F	F	F	.	.	.	.	.	.	.	.	.	.	.	.
<i>Darwinia thymoides</i>	F	.	.	.	.	.	.	.	F	F	F	F	.	.	.	.	.	.	.	.	.	.	.	.
<i>Eucalyptus accedens</i>	F	F	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Eucalyptus calophylla</i>	F	F	F	F	F	F	.	.	.	.	.	.	+	+	+	+	+	+	+	+	+	+	+	+
<i>Eucalyptus marginata</i>	F	F	.	.	.	.	.	.	.	.	.	.	+	+	+	+	+	+	+	+	+	+	+	+
<i>Eucalyptus patens</i>	F	F	F	F	.	.	.	.	.	.	.	.	+	+	+	+	+	+	+	+	+	+	+	+
<i>Eucalyptus rudis</i>	.	.	F	F	F	F	F	F	F	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Eucalyptus wandoo</i>	.	F	F	F	F	F	F	F	F	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Hypocalymma angustifolium</i>	.	.	.	.	.	.	F	F	F	F	F	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Hypocalymma robustum</i>	.	.	.	.	.	.	.	F	F	F	F	.	+	+	+	+	+	+	+	+	+	+	+	+
<i>Kunzea recurva</i>	.	.	.	.	.	.	.	.	F	F	F	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Leptospermum erubescens</i>	.	.	.	.	.	.	.	.	F	F	F	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Melaleuca incana</i>	.	.	.	.	.	.	.	.	F	F	F	.	+	.	.	.	.	.	.	.	.	.	.	.
<i>Melaleuca lateritia</i>	F	.	.	.	.	.	.	.	F	F	F	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Melaleuca preissiana</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Melaleuca radula</i>	.	.	.	.	.	.	.	.	F	F	F	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Melaleuca raphiophylla</i>	.	.	.	.	.	.	.	.	F	F	F	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Melaleuca scabra</i>	F	.	.	.	.	.	.	.	F	F	F	F	.	.	.	.	.	.	.	.	.	.	.	.
<i>Melaleuca trichophylla</i>	.	.	.	.	.	.	.	.	F	F	F	F	+	+	+	+	+	+	+	+	+	+	+	+

		FLOWERING MONTH			LOCATION WITHIN JOHN FORREST NATIONAL PARK																																		
		J	F	M	A	M	J	J	A	S	O	N	D																										
														0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	2	2	2	2					
														1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2				
<i>Verticordia acerosa</i>		.	.	.	.	.	.	.	.	F	F	F	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Verticordia densiflora</i>		.	.	.	.	.	.	.	.	.	.	F	F	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Verticordia huegelii</i>		.	.	.	.	.	.	.	F	F	F	F	F	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Verticordia pennigera</i>		.	.	.	.	.	.	.	.	.	F	F	F	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Verticordia plumosa</i>		F	F	.	.	.	.	F	F	F	F	F	F	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
ONAGRACEAE																																							
* <i>Oenothera stricta</i>		.	.	.	.	.	.	.	.	.	.	F	F	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
HALORAGACEAE																																							
<i>Glisthrocarpon aureum</i>		.	.	.	.	.	.	.	.	.	.	F	F	F	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Gonocarpus cordiger</i>		F	F	.	.	.	.	.	.	.	.	F	F	F	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Gonocarpus nodulosus</i>		.	.	.	.	.	.	.	.	.	.	F	F	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
APIACEAE																																							
<i>Actinotus leucoccephalus</i>		F	.	.	.	.	.	.	.	.	.	.	F	F	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Centella cordifolia</i>		F	F	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Daucus gluchidatus</i>		.	.	.	.	.	.	.	.	F	F	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Eryngium rostratum</i>		.	.	.	.	.	.	.	.	F	F	F	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Hydrocotyle calliarpa</i>		.	.	.	.	.	.	.	.	F	F	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Pentapeltis peltigera</i>		F	F	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Platysace compressa</i>		F	F	F	F	F	F	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Platysace juncea</i>		F	F	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Schoenolaena juncea</i>		F	F	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Trachymene coerulea</i>		F	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Trachymene pilosa</i>		F	.	.	.	.	.	.	.	.	F	F	F	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Xanthostoma atkinsoniana</i>		F	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Xanthostoma candida</i>		F	.	.	.	.	.	.	.	.	F	F	F	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

FAMILY	FLOWERING MONTH												LOCATION WITHIN JOHN FORREST NATIONAL PARK																								
	J	F	M	A	M	J	J	A	S	O	N	D	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	2	2	2	2					
Genus/species													0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	2	2	2				
APIACEAE (cont.)													1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2			
<i>Xanthosia ciliata</i>	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Xanthosia huegelii</i>	F	.	.	.	.	.	.	F	F	F	F	F	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
EPACRIDACEAE																																					
<i>Andersonia aristata</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Andersonia lehmanniana</i>	.	.	.	.	.	.	.	.	.	.	.	.	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>Astroloma ciliatum</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Astroloma pallidum</i>	.	F	F	F	F	F	F	F	F	F	F	F	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Leucopogon capitellatus</i>	.	.	.	.	.	.	.	.	.	.	.	.	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>Leucopogon nutans</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Leucopogon propinquus</i>	.	F	F	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Leucopogon pulchellus</i>	.	.	.	.	.	.	.	.	.	.	.	.	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>Leucopogon sprengeliioides</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Leucopogon strictus</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Lysinema ciliatum</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Styphelia tenuiflora</i>	.	.	.	.	.	.	.	.	.	.	.	.	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
PRIMULACEAE																																					
* <i>Anagallis arvensis</i>	.	.	.	.	.	.	.	.	.	.	.	.	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
LOGANIACEAE																																					
<i>Logania campanulata</i>	F	F
<i>Mitrasacme paradoxa</i>
GENTIANACEAE																																					
* <i>Centaurium erythraea</i>	F	F	F
* <i>Cicendia filiformis</i>

FAMILY	FLOWERING MONTH												LOCATION WITHIN JOHN FORREST NATIONAL PARK																											
	J	F	M	A	M	J	J	A	S	O	N	D	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	2	2	2										
Genus/species													1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2						
LENTIBULARIACEAE																																								
<i>Utricularia tenella</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Utricularia violacea</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
PLANTAGINACEAE																																								
* <i>Plantago lanceolata</i>	F	F	.	.	.	.	.	.	.	.	.	F	F	F	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
RUBIACEAE																																								
* <i>Galium divaricatum</i>	.	.	.	.	.	.	.	.	.	.	.	F	F	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Opercularia apiciflora</i>	.	.	.	.	.	.	.	.	.	.	.	F	F	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Opercularia achinocephala</i>	.	.	.	.	.	.	.	.	.	.	.	F	F	F	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Opercularia vaginata</i>	.	.	.	.	.	.	.	.	.	.	.	F	F	F	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
CAMPANULACEAE																																								
* <i>Wahlenbergia capensis</i>	.	.	.	.	.	.	.	.	.	.	.	F	F	F	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Wahlenbergia preissii</i>	.	.	.	.	.	.	.	.	.	.	.	F	F	F	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
LOBELIACEAE																																								
<i>Isotoma hypocrateriformis</i>	F	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Lobelia alata</i>	F	F	F	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Lobelia gibbosa</i>	.	F	F	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Lobelia heterophylla</i>	F	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Lobelia rhombifolia</i>
<i>Lobelia rhytidosperma</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
* <i>Monopsis simplex</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
GOODENIACEAE																																								
<i>Dampiera alata</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Dampiera linearis</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

FAMILY	FLOWERING MONTH												LOCATION WITHIN JOHN FORREST NATIONAL PARK											
	J	F	M	A	M	J	J	A	S	O	N	D	0	0	0	0	0	0	0	0	0	0	0	0
Genus species													1	2	3	4	5	6	7	8	9	0	1	
STYLIDIACEAE (cont)																								
<i>Stylidium pycnostachyum</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Stylidium repens</i>	F	F	F	F	F	F	.	.	.	.	F	.	.	.	.	.	.	.	.	.	.	.	.
<i>Stylidium schoenoides</i>	.	.	.	.	.	.	.	F	.	.	.	.	+	+	+	+	+	+	+	+	+	+	+
ASTERACEAE																								
* <i>Arctotheca calendula</i>	.	.	.	.	.	.	.	F	F	F	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Blennospora drummondii</i>	.	.	.	.	.	.	.	F	F	F	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Brachycome iberidifolia</i>	.	.	.	.	.	.	.	F	F	F	F	.	.	.	.	.	.	.	.	.	.	.	.
<i>Brachycome pusilla</i>	.	.	.	.	.	.	.	F	F	F	.	.	.	.	.	.	.	.	.	.	.	.	.
* <i>Conyza albida</i>	F	F	F	.	.	.	.	.	.	.	F	F	.	.	.	.	.	.	.	.	.	.	.
<i>Craspedia</i> sp. A	.	.	.	.	.	.	.	F	F	F	.	.	.	.	.	.	.	.	.	.	.	.	.
* <i>Dittrichia graveolens</i>	.	.	F	F	F	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
* <i>Filago gallica</i>	.	.	.	.	.	.	.	.	.	.	F	.	.	.	.	.	.	.	.	.	.	.	.
* <i>Hedynois rhagadioloides</i>	.	.	.	.	.	.	.	.	.	.	F	F	.	.	.	.	.	.	.	.	.	.	.
<i>Helichrysum lindleyi</i>	.	.	.	.	.	.	.	.	.	F	F	.	.	.	.	.	.	.	.	.	.	.	.
<i>Helichrysum macranthum</i>	.	.	.	.	.	.	.	.	.	.	F	F	.	.	.	.	.	.	.	.	.	.	.
<i>Helipterum corymbosum</i>	.	.	.	.	.	.	.	.	.	.	F	F	.	.	.	.	.	.	.	.	.	.	.
<i>Helipterum cotula</i>	.	.	.	.	.	.	.	.	.	F	F	.	.	.	.	.	.	.	.	.	.	.	.
<i>Helipterum manglesii</i>	.	.	.	.	.	.	.	.	.	F	F	.	.	.	.	.	.	.	.	.	.	.	.
* <i>Hypochaeris glabra</i>	F	F	F	F	F	F	.	.	.	F	F	F	.	.	.	.	.	.	.	.	.	.	.
<i>Lagenifera huegelii</i>	.	.	.	.	.	.	.	F	F	F	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Millotia tenuifolia</i>	.	.	.	.	.	.	.	.	.	F	F	F	.	.	.	.	.	.	.	.	.	.	.
<i>Olearia paucidentata</i>	F	.	F	F	F	.	.	.	.	F	.	.	.	.	.	.	.	.	.	.	.	.	.
* <i>Osteospermum clandestinum</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Pithocarpa corymbulosa</i>	F	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Pithocarpa pulchella</i>	.	.	.	.	F	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

	FLOWERING MONTH												LOCATION WITHIN JOHN FORREST NATIONAL PARK											
	J	F	M	A	M	J	J	A	S	O	N	D	0	0	0	0	0	0	0	0	0	0	0	
<i>Podolepis canescens</i>	F	F	.	.	.	.	.	.	.	.	.	.	.	.
<i>Podolepis gracilis</i>	F	F	F	.	.	.	.	.	.	.	.	.	.	.
<i>Podolepis lessonii</i>	F	F	F	.	.	.	.	.	.	.	.	.	.	.
<i>Podotheca angustifolia</i>	F	.	.	.	.	.	.	.	.	.	.	.	.
* <i>Pseudognaphalium luteoalbum.</i>	F	F	.	.	.	.	.	.	.	.	.	.	.
<i>Quinetta urvillei</i>	F	F	.	.	.	.	.	.	.	.	.	.	.	.
<i>Rutidosia multiflora</i>	F	F	.	.	.	.	.	.	.	.	.	.	.	.
<i>Senecio quadridentatus</i>	F	.	.	.	.	.	.	.	F	F	F	.	.	.	.	.	.	.	.	.	.	.
<i>Siloxerus filifolius</i>	F	F	F	.	.	.	.	.	.	.	.	.	.	.
* <i>Sonchus oleraceus</i>	F	F	F	.	.	.	.	.	.	.	.	.	.	.
<i>Trichocline spathulata</i>	F	.	.	.	.	.	.	.	F	F	F	.	.	.	.	.	.	.	.	.	.	.
* <i>Ursinia anthemoides</i>	F	F	.	.	.	.	.	.	.	.	.	.	.	.
<i>Waitzia aurea</i>	F	F	.	.	.	.	.	.	.	.	.	.	.
<i>Waitzia paniculata</i>	F	F	F	.	.	.	.	.	.	.	.	.	.
<i>Waitzia suaveolens</i>	F	.	.	.	.	.	.	.	.	.	F	.	.	.	.	.	.	.	.	.	.	.